

Claims

1. A method for preventing elution of the fuel electrode of a direct methanol fuel cell in which a fuel electrode and an air electrode each of which contains an electrode catalyst consisting of at least a noble metal or carbon supporting the noble metal and a proton conductive solid polymer electrolyte are provided on respective sides of a proton conductive solid polymer electrolyte membrane and that is made capable of generating electricity by being supplied with methanol and water to the fuel electrode and being supplied with oxygen in the air to the air electrode, wherein elution of the proton conductive solid polymer electrolyte and the electrode catalyst into the fuel from the fuel electrode is prevented by setting the methanol concentration in the fuel supplied to the fuel cell to less than 2 M.

2. A method for preventing elution of the fuel electrode of the direct methanol fuel cell according to claim 1, wherein the methanol concentration is set equal to or less than 1.5 M, and the operating temperature set equal to or less than 90°C.

3. A quality control method of a direct methanol fuel cell in which a fuel electrode and an air electrode each of which contains an electrode catalyst consisting of at least a noble metal or carbon supporting the noble metal and a proton conductive solid polymer electrolyte are provided on respective sides of a proton conductive solid polymer electrolyte membrane and that is made capable of generating electricity by being supplied with methanol and water to the fuel electrode and being supplied with oxygen in the air to the air electrode, wherein a characteristic of elution of the fuel electrode material into the fuel is evaluated.

4. A quality control method of the direct methanol fuel cell according to claim 3, wherein the elution characteristic is evaluated by detecting a change in the characteristic of the fuel electrode associated with the elution of the fuel electrode material into the fuel when the fuel electrode is brought into contact with the fuel whose concentration exceeds 2 M or the fuel whose temperature exceeds 80°C.

5. An operation method of a direct methanol fuel cell in which a fuel electrode and an air electrode each of which contains an electrode catalyst consisting of at least a noble metal or carbon supporting the noble metal and a proton conductive solid polymer electrolyte are provided on respective sides of a proton conductive solid polymer electrolyte membrane and that is made capable of generating electricity by being supplied with methanol and water to the fuel electrode and being supplied with oxygen in the air to the air electrode, wherein when the elution of the fuel electrode material into the fuel is detected, the detection of elution is fed back so that the fuel concentration is decreased, or the operating temperature is lowered, or an output of the fuel cell is limited.

6. An operation method of the direct methanol fuel cell according to claim 5,

wherein a window through which the color of the fuel is observed or a sensor for detecting the color of the fuel is provided, so that the elution of the fuel electrode material into the fuel is detected by a change in the color of the fuel.

7. A direct methanol fuel cell in which a fuel electrode and an air electrode each of which contains an electrode catalyst consisting of at least a noble metal or carbon supporting the noble metal and a proton conductive solid polymer electrolyte are provided on respective sides of a proton conductive solid polymer electrolyte membrane and that is made capable of generating electricity by being supplied with methanol and water to the fuel electrode and being supplied with oxygen in the air to the air electrode, further comprising:

means for detecting or inputting elution of the fuel electrode material into the fuel; and control means for, when the detection or inputting was done, feeding back the detection of elution so that a fuel concentration is decreased, or an operating temperature is lowered, or an output of the fuel cell is limited.

8. A direct methanol fuel cell according to claim 7, wherein an window through which the color of the fuel is observed or a sensor for detecting the color of the fuel is provided.

9. A direct methanol fuel cell in which a fuel electrode and an air electrode each of which contains an electrode catalyst consisting of at least a noble metal or carbon supporting the noble metal and a proton conductive solid polymer electrolyte are provided on respective sides of a proton conductive solid polymer electrolyte membrane and that is made capable of generating electricity by being supplied with methanol and water to the fuel electrode and being supplied with oxygen in the air to the air electrode, wherein at least the direct methanol fuel cell is heat-treated.

10. A direct methanol fuel cell according to claim 9, wherein the fuel electrode is pressure-joined to the solid polymer electrolyte membrane as the heat treatment at a temperature of 150-250°C.

11. A direct methanol fuel cell according to claim 9, wherein the fuel electrode is dried at a temperature of 120-250°C as the heat treatment after impregnation of the proton conductive solid polymer electrolyte.

12. A direct methanol fuel cell according to claim 9, wherein the fuel electrode is irradiated with radiation under heating as the heat treatment.

13. A method for manufacturing a direct methanol fuel cell in which a fuel electrode and an air electrode each of which contains an electrode catalyst consisting of at least a noble metal or carbon supporting the noble metal and a proton conductive solid polymer electrolyte are provided on respective sides of a proton conductive solid polymer electrolyte membrane and that is made capable of generating electricity by being supplied with methanol and water to the fuel electrode and being supplied with oxygen in the air to the air electrode, further comprising at least the step of heat-treating the fuel electrode.

14. A method for manufacturing the direct methanol fuel cell according to claim 13, wherein in the heat treatment step, the fuel electrode is pressure-joined to the solid polymer electrolyte membrane at a temperature of 150-250°C.

15. A method for manufacturing the direct methanol fuel cell according to claim 13, wherein in the heat treatment step, the fuel electrode is pressure-joined to the solid polymer electrolyte membrane at a temperature of 170-210°C.

16. A method for manufacturing the direct methanol fuel cell according to claim 13, wherein in the heat treatment step, the fuel electrode is impregnated with the proton conductive solid polymer electrolyte and subsequently dried at a temperature of 120-250°C.

17. A method for manufacturing the direct methanol fuel cell according to claim 13, wherein in the heat treatment step, the fuel electrode is irradiated with radiation under heating.

18. A method for manufacturing the direct methanol fuel cell according to claim 13, wherein the heat treatment step is conducted in a vacuum or an inert gas.